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TREATMENT OF HOSPITAL WASTES

RESEARCH BRANCH

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Hospitals produce a considerable volume of liquid waste made up of normal sewage, washings and wastes disposed of via toilets, as well as laundry and cleaning waste-water. The discharge computed per capita for the average hospital is roughly twice the normal amount, as a result of a much higher consumption for cleaning and laundry purposes than the ordinary household. Allowance must be made for a greater volume of waste-water, from a hydraulic standpoint, but of chief concern is whether or not there is a greater risk of disease transmission from such wastes as compared to domestic wastes from the general population.

A hospital discharge would be expected to contain larger amounts of certain substances, such as antibiotics, disinfectants, rags, etc., which might affect subsequent treatment of the sewage, and a great number of pathogenic bacteria. These latter are normally assumed to be destroyed by normal methods of sewage treatment. Leibmann (1) has noted no significant detrimental effect on treatment processes due to the presence of antibiotics and disinfectants at the levels at which they are present in hospital discharges. Certainly, where such wastes are discharged to a sewer system, the considerable dilution and mixing which would normally be effected before reaching the sewage treatment plant, would tend to obviate any such effects.

Most notably in Germany, regulations for the disinfection of hospital wastes do exist, and heat treatment has been found to be the most satisfactory (1). In other parts of the world, some infectious disease hospitals chlorinate their wastes before discharge to the sewer, but the public health value of this treatment has not been determined. Antze and



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and Hösel have concluded (2), that a larger number of pathogens originate from domestic sewage than from hospital waste-waters. Coin (3) expresses a similar opinion by stating that the public sewers constitute the principle source of spread of viruses in the natural environment.

If the characteristic epidemiology of bacterial infectious diseases is considered, the situation may better be understood. Even in the case of severe enteric diseases, such as typhoid, where waterborne transmission is unquestioned, it must be realized that the infected individual was disseminating the infection within the community before hospitalization (4) and therefore presents no greater hazard once within hospital confines. Symptomless carriers, and persons fully recovered from the disease also continue to excrete large numbers of organisms, and can represent a considerable fraction (5) of the community at large.

Enteric virus diseases present a similar epidemiological picture. It is possible that a single virus may initiate an infection in a susceptible individual; the individual may become a clinical case of the disease, a symptomless carrier or suffer from a mild almost unnoticed illness. Although all infections result in excretion of the virus, only the clinical cases would be likely to be hospitalized. For instance, in a poliomyelitis epidemic the number of subclinical cases was estimated at 140 times the number of clinical, hospitalized cases (6). It should be noted that where there is an infectious disease within a hospital, regulations require that stringent precautions be taken with everything coming in contact with the patient, normally involving autoclaving or strong chemical disinfection. This is designed to prevent intra-hospital spread and no hazard to the general community should result; disinfection and hygiene at the hospital bedside, in the opinion of Eyer (7), are far more important than the disinfection of hospital sewage.

A great number of studies have investigated the persistence of the bacillus of tuberculosis (TB) in the sewage from sanatoria. These bacilli are among the most resistant pathogenic bacteria known, and control of the disease is a major public health concern. The conclusions of Greenberg and Kupka (8) are that sewage from institutions treating tuberculosis patients almost always contains tubercle bacilli. Where direct discharge to a receiving water is contemplated, complete treatment with a chlorination dosage to 20 ppm applied to the effluent, with a contact time of 2 hours, is necessary. It has been shown (9), that the TB bacillus will survive passage through a septic tank but not apparently, subsequent treatment in a shallow oxidation lagoon with a retention time of approximately 20 days. In any event, even if precautions are taken at the institutional level, normal urban sewage contains demonstrable numbers of TB bacilli, and effluents from sewage treatment plants will still contain a portion of this number (10). Although where adequate treatment is given, and a sufficient dilution factor is available upon discharge, there is no public health hazard, the concensus of opinion appears to be that wastes from TB sanatoria with their own sewage treatment plant should not be used for irrigation purposes. Additionally, the sludge from the treatment plant should be thoroughly disinfected before disposal.

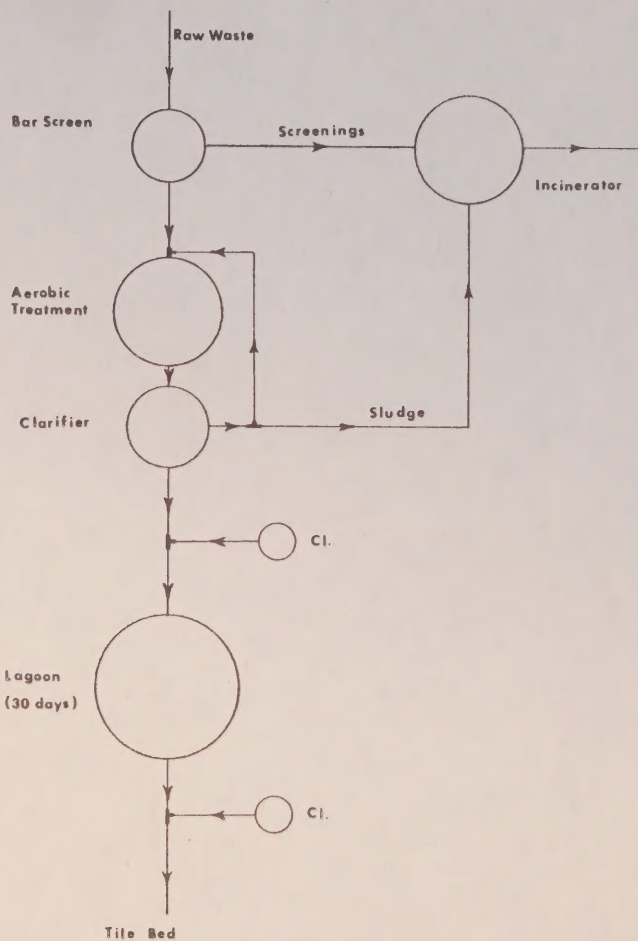
Conclusion

The foregoing outline would indicate that there is a potential health hazard associated with any sewage discharge, whether from a hospital, sanatorium or municipal sewage treatment plant. There appears, in general, to be no greater risk associated with hospital or sanatoria wastes.

Therefore, where it is possible, hospital and sanatoria wastes should be directed to the municipal sewage systems. Where a municipal system is not available, the wastes should be given conventional treatment; the recommended form of treatment is represented diagrammatically in Fig. 1 (11). Bar screens, with incineration of the screenings, remove rags and dressings from the influent. Screening should be followed by conventional, aerobic biological treatment preferably with sludge incineration. After preliminary chlorination, the effluent should be passed to a holding pond or secondary sedimentation basin with a minimum of 48 hours and preferably 30 days retention. Post-chlorination should then be given before effluent disposal to a tile bed or if necessary, to a surface waterway. It has been found that a free chlorine residual, measured amperometrically of 0.2 to 0.4 mg per litre, with a retention time of thirty minutes, would result in complete virus inactivation (12). A considerably longer retention time would be required were lower chlorine residuals used.

Such a system, by incinerating solids from a biological growth system, minimizes the possibility of the dissemination of pathogens. The provision of post-chlorination and a holding tank or lagoon, assuming chlorine residual and retention time are sufficient, especially when followed by a soil seepage system, provide the best system presently known for virus inactivation (13).

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